

CLAIMS

WE CLAIM:

1. A method for fabricating a solder bump structure for use on a substrate, comprising the steps of:
 - (a) applying a multilayer underbump metallization onto said substrate;
 - (b) applying a thin layer of a metal selected from a group consisting of titanium, chrome, a titanium-nickel-titanium composite, a titanium-nickel-chrome composite, a titanium-platinum-titanium composite, and a titanium-nickel-oxidized silicon composite over or under said multilayer underbump metallization;
 - (c) applying a solder bump onto said underbump metallization;
 - (d) removing said thin layer of said metal in region spaced from said underbump metallization; and
 - (e) heating said substrate to melt said solder bump and to wet it back from said thin layer of said metal.
2. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, further comprising the steps of:
 - (f) applying and patterning a removable protective layer so that said multilayer underbump metallization is exposed;

and

(g) removing said protective layer after said applying of said solder bump and after said removing of said thin layer of said metal.

3. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of applying said solder bump further comprises applying the solder bump onto said thin layer of said metal.
4. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said substrates are fabricated from materials selected from a group consisting essentially of X and Y-Z,
where X is an element selected from a group consisting of elements of Period IV of Periodic Table, Y is an element selected from a group consisting of elements of Period III of Periodic Table, and Z is an element selected from a group consisting of elements of Period V of Periodic Table.
5. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of applying multilayer underbump metallization comprises:

- (a) applying a layer of titanium with a thickness within a range of between about 0.02 and about 0.05 micrometers;
- (b) applying a layer of nickel with a thickness within a range of between about 0.5 and about 1.0 micrometers onto said layer of titanium; and
- (c) applying a layer of gold with a thickness within a range of between about 0.05 and about 0.2 micrometers onto said layer of nickel.

- 6. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein the step of applying said multilayer underbump metallization includes lifting off a multilayer structure.
- 7. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said thin layer of the metal has a thickness within preferably a range of between 200 and 1,000 Angstroms.
- 8. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said solder bump comprises an alloy of tin and lead.

9. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of applying of said solder bump comprises electroplating said solder into a via formed in a mask overlying said thin layer of said metal.
10. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said removing of said thin layer of said metal comprises the step of patterning a mask and using wet etching and/or dry etching.
11. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein the step of applying of said thin layer of said metal comprises applying a layer of said metal by deposition by evaporating and by lifting off of said thin layer of said metal.
12. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of said applying of said multilayer underbump metallization is preceded by a step of applying of an insulating film of silicon nitride and/or polyimide.

13. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of said applying of said multilayer underbump metallization is preceded by a step of applying of a sealant feature.
14. The method for fabricating a solder bump structure for use on a substrate according to Claim 1, wherein said step of applying of said underbump metallization is preceded by a step of applying and patterning of said sealant feature.
15. The method for fabricating a solder bump structure for use on a substrate according to Claim 2, wherein said step of applying of said removable layer of said photoresist comprises the steps of:
- (a) spinning said photoresist on the substrate;
 - (b) patterning said layer of said photoresist on the surface;
and
 - (c) contour-baking said layer of said photoresist so as to round any edges.
16. The method for fabricating a solder bump structure for use on a substrate according to Claim 2, wherein said removable protective layer is made of a material selected from a group

comprising a photoresist, a photodefinable polyimide, a spin-on glass and a spin-on conductive polymer.

17. The method for fabricating a solder bump structure for use on a substrate according to Claim 2, wherein said removable layer of said photoresist has a thickness within a range of between about 0.5 and about 40 micrometers.

18. The method for fabricating a solder bump structure for use on a substrate according to Claim 2, wherein said step of removing of said protective layer of said photoresist comprises using a solvent and dry etching.

19. The method for fabricating a solder bump structure for use on a substrate according to Claim 13, wherein said sealant feature is made of titanium.

20. The method for fabricating a solder bump structure for use on a substrate according to Claim 19, wherein said sealant feature is having a thickness between about 0.02 and 0.20 micrometers.

21. A solder bump structure for use on a substrate, comprising:

- (a) a multilayer underbump metallization;
- (b) a thin layer of a metal selected from a group consisting of titanium, chrome, a titanium-nickel-titanium composite, a titanium-nickel-chrome composite, a titanium-platinum-titanium alloy, and a titanium-nickel-oxidized silicon composite deposited over or under said multilayer underbump metallization and adjacent to said multilayer underbump metallization; and
- (c) a solder bump on top of said underbump metallization.

22. The solder bump structure according to Claim 21, wherein said solder bump is applied onto said thin layer of said metal.

23. The solder bump structure according to Claim 21, wherein said substrate is fabricated from materials selected from a group consisting essentially of X and Y-Z, where X is an element selected from a group consisting of elements of Period IV of Periodic Table, Y is an element selected from a group consisting of elements of Period III of Periodic Table, and Z is an element selected from a group consisting of elements of Period V of Periodic Table.

24. The solder bump structure according to Claim 21, wherein said

multilayer underbump metallization further comprises: '

- (a) a layer of titanium with a thickness within a range of between about 0.02 and about 0.05 micrometers;
- (b) a layer of nickel with a thickness within a range of between about 0.5 and about 1.0 micrometers onto said layer of titanium; and
- (c) a layer of gold with a thickness within a range of between about 0.05 and about 0.2 micrometers onto said layer of nickel.

- 25. The solder bump structure according to Claim 21, wherein said thin layer of the metal has a thickness within a range of between about 200 and about 1,000 Angstroms.
- 26. The solder bump structure according to Claim 21, wherein said solder bump comprises an alloy of tin and lead.
- 27. The solder bump structure according to Claim 21, further comprising an insulating film arranged under said multilayer underbump metallization, wherein said insulating film comprises silicon nitride and polyimide.
- 28. The solder bump structure according to Claim 21, further

comprising a sealant feature arranged under said multilayer underbump metallization.

29. The solder bump structure according to Claim 21, further comprising said insulating film arranged under said multilayer underbump metallization and said sealant feature arranged between said multilayer underbump metallization and said insulating film.
30. The solder bump structure according to Claim 28, wherein said sealant feature is made of titanium.
31. The solder bump structure according to Claim 28, wherein said sealant feature ^{has} ~~is having~~ a thickness between about 0.02 and 0.20 micrometers.